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(54) Gasketing of heat transfer plates

(57) In heat transfer apparatus of the plate type, gaskets around the plates are normally elastomeric gaskets fixed by adhesive into pressed recesses in the plates. These gaskets are expensive and the technique of fixing and replacing them is time consuming. In accordance with the present invention, a pressed groove 8 in a plate includes an insert 9 of metal or plastics material and formed with accurate grooves (10, 11) to receive seals (12, 14) to engage the base 13 of the pressed groove 8 and against the adjacent plate respectively.

The grooves 10 and 11 and the gaskets 12 and 14 may be duplicated to form double seals.

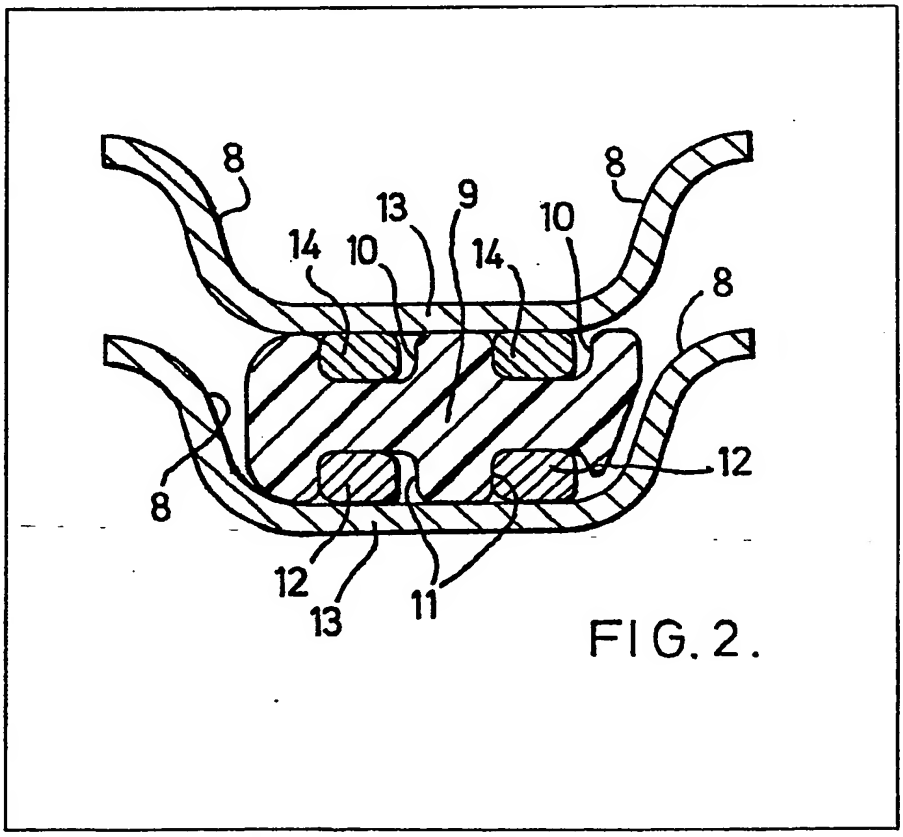

FIG. 2.

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The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.
This print takes account of replacement documents later filed to enable the application to comply with the formal requirements of the Patents Rules 1978.

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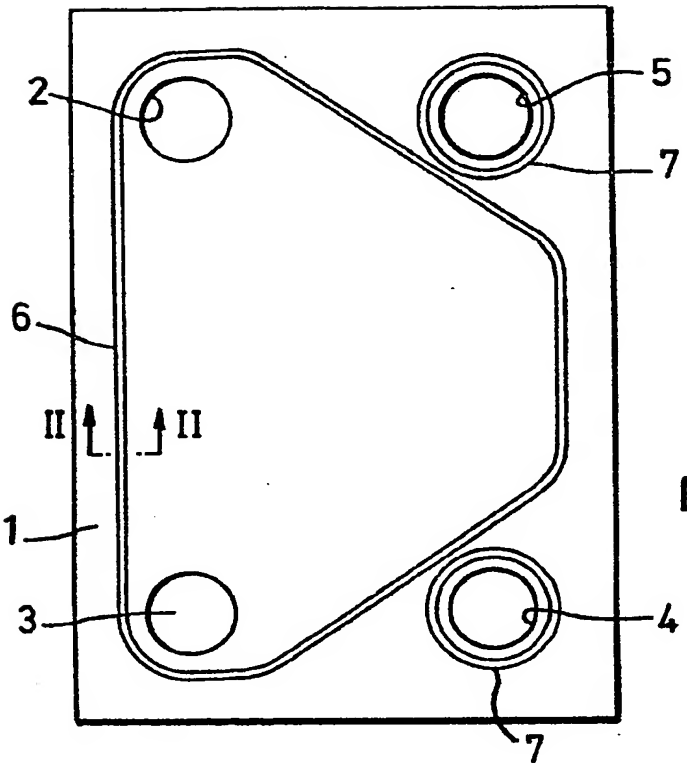

FIG.1.

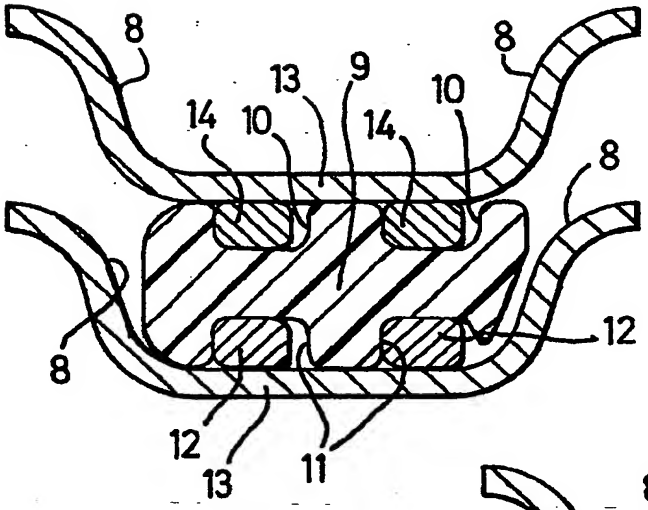

FIG.2.

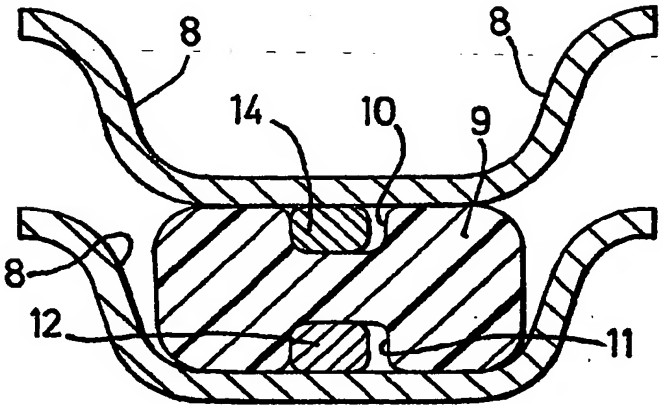

FIG.3.

SPECIFICATION

Gasketing of heat transfer plates

This invention relates to the gasketing of plate heat transfer apparatus.

A plate heat transfer apparatus, i.e. either a plate heat exchanger or a plate evaporator, consists of a series of plates arranged spaced face-to-face relationship to form flow spaces between the plates. The boundaries of the flow spaces are formed and sealed by gaskets, which are normally mounted in grooves pressed into the plates. The gaskets are normally of a rubber or rubber-like material and are retained in their respective grooves by adhesive. The initial fitting of the gaskets in the grooves is a fairly time-consuming process involving surface preparation, applications of adhesive, location of the gasket in the groove and probably curing of the adhesive. When the gasket needs to be replaced, the old gasket has to be stripped out, the metal surface cleaned of old adhesive and then the new gasket has to be fitted as enumerated above.

If, instead of being pressed, the gasket recesses were precision machined grooves, the sealing could be more easily obtained by using preformed O-ring, lip or other similar seals which would be a close mechanical fit in the grooves and would therefore not need to be retained by adhesive. Also, the reduced size of the gaskets would reduce the compression load necessary.

However, when using the usual metal thickness (e.g. 0.7 mm) of plate heat transfer apparatus, precision machining of grooves is not practicable and for many years the use of adhesive has been the normal practice in the industry.

Our co-pending application 8026457, published under number 2057668, describes and claims a proposal for a heat transfer plate having a pressed gasket groove which is at least partially filled with a plastics material which adheres to the plate metal and which is formed with an accurate groove adapted to receive, or receiving, a preformed seal of O-ring, lip or other appropriate type.

The intermediate filling of plastics material is intended to provide a medium in which an accurate groove can be provided.

According to the present invention, there is provided a heat transfer plate having a pressed gasket groove with a base and side walls, and, located within the groove, an insert having accurately formed gasket grooves on two opposed faces to receive or receiving preformed gaskets to seal against the base of the pressed groove and against the adjacent surface of an adjacent plate respectively.

By using an insert, the preformed gasket may be mounted on the insert, and the insert carries gasketing to seal against the plate in which it is inserted and the adjacent plate.

Accordingly, no adhesive is required to attach the sealing gasket, conventional commercially available gasket forms may be used, the gasket loading may be reduced, which leads to easier tightening of the frame of the heat transfer apparatus, the application of the gasket can be automated more easily and the replacement of gaskets is facilitated.

The invention will be further described with reference to the accompanying drawings, in which:—

Figure 1 is an elevation of a form of heat exchanger plate in accordance with a form of the present invention and having a double seal gasket;

Figure 2 is a section on the line II—II of Figure 1 showing a second plate, and

Figure 3 is a diagrammatic section similar to Figure 2 showing a form of single seal applied according to the techniques of the present invention.

Turning first to figure 1, a heat exchanger plate is illustrated at 1 and as having four corner ports 2, 3, 4 and 5. The line of a peripheral gasket, of double seal form, is indicated at 6, and it will be noted that the corner ports 4 and 5 also have port gaskets 7, also of double seal nature.

Figure 2 shows portions of two adjacent heat exchanger plates 1 and each being provided with a pressed-in gasket recess 8.

The lower of the two gasket grooves 8 shown in Figure 2 is illustrated as having fitted therein an insert 9 extending the whole distance round the continuous gasket groove. The insert 9 could be a rolled or extruded metal section, suitably shaped, or it could be a moulding or extrusion in plastics material. The insert 9 is provided with two pairs of gasket recesses 10 and 11. The recesses 11 house gaskets 12 which engage and seal against the base 13 of the groove in which the insert is housed. The recesses or grooves 10 receive gaskets 14 which engage against the adjacent side of the adjacent plate. As illustrated, this is the underside of the base 13 of the pressed groove 8 of the adjacent plate.

In a peripheral gasket, there would normally be a further similar insert in the pressed groove 8 of the adjacent plate, and this arrangement will continue right through the pack of plates. However, in the area of the port gaskets 7, normally only alternate pressed grooves 8 would receive inserts and gaskets and the intervening ones would be clear of such inserts and gaskets in order to enable communication between the ports and the flow spaces.

It will be appreciated that when dealing with hazardous fluids, a double seal of this nature is beneficial, especially if the space between them is monitored for leakage of the hazardous fluid so that this leakage is detected before the harzardous fluid leaks past the second seal into the ambient atmosphere. For this purpose, the space between the two seals 12 or 14 may have an appropriate fluid pumped through it and in circuit with a detector to detect the presence of the hazardous fluid in the diluent. Suitable micro-bore piping may be used to make the connections.

Figure 3 shows an arrangement in which the insert 9 has only a single groove 10 and a single groove 11 each receiving the appropriate gasket

12 or 14.

Various modifications may be made within the scope of the invention. For instance, although O-ring type seals have been shown for the gaskets 12 and 14, lip or other seals could be used instead.

CLAIMS

1. A heat transfer plate having a pressed gasket groove with a base and side walls, and, located within the groove, an insert having accurately formed gasket grooves on two opposed faces to receive or receiving preformed gaskets to seal against the base of the pressed groove and against the adjacent surface of an adjacent plate respectively.

2. A heat transfer plate as claimed in claim 1, in which at least one of the faces of the insert is formed with two or more gasket grooves to receive gaskets to provide a double or multi-fold seal.

3. A heat transfer plate as claimed in claim 2, in which the space between the gasket of the double seal is monitored for leaking fluid.

4. A heat transfer plate as claimed in claim 3, in which the monitoring is achieved by circulating a gas or liquid through the space.

5. A heat transfer plate having gasketing substantially as hereinbefore described with reference to the accompanying drawings.

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